

## SENSORTRACE BASIC 3.0 USER MANUAL



**SENSORTRACE BASIC 3.0 USER MANUAL**

Copyright © 2010 · Unisense A/S

Version October 2010

**SENSORTRACE BASIC 3.0 USER MANUAL**

UNISENSE A/S

## TABLE OF CONTENTS

CONGRATULATIONS WITH YOUR NEW PRODUCT! .....	1
SUPPORT, ORDERING, AND CONTACT INFORMATION .....	1
OVERVIEW .....	3
INSTALLING THE SOFTWARE .....	4
GETTING STARTED.....	5
SENSORTRACE BASIC INTERFACE .....	6
THE STRIP CHART.....	7
SETTINGS TAB .....	10
COMMENTS-TAB.....	12
CALIBRATION-TAB .....	14
CALIBRATION PROCEDURE: .....	15
LOGGER-TAB .....	17
SAMPLING INTERVAL .....	17
RECORDING DATA .....	18
OUTPUT-FILE .....	20
WARRANTY AND LIABILITY.....	23
REPAIR OR ADJUSTMENT .....	23

## CONGRATULATIONS WITH YOUR NEW PRODUCT!

### **SUPPORT, ORDERING, AND CONTACT INFORMATION**

If you wish to order additional products or if you encounter any problems and need scientific/technical assistance, please do not hesitate to contact our sales and support team. We will respond to your inquiry within one working day.

E-mail: [sales@unisense.com](mailto:sales@unisense.com)

Unisense A/S  
Tueager 1  
DK-8200 Aarhus N, Denmark  
Tel: +45 8944 9500  
Fax: +45 8944 9549

Further documentation and support is available at our website  
[www.unisense.com](http://www.unisense.com).

## OVERVIEW

SensorTrace BASIC is the basic data acquisition program from the Unisense program package. It offers timeseries datalogging and calibration features.

SensorTrace BASIC is compatible with all digital Unisense instruments. It supports up to 16 channels with an adjustable logging frequency of up to 10 samples per second. The program automatically saves all data in an MS Excel formatted file for subsequent data analysis.

The software is freeware and can be downloaded from our webpage.

### System requirements

- A digital Unisense amplifier or A/D-converter unit.
- PC with
  - Windows XP/2000/Vista
  - min. 100 MB free hard disk space
  - USB port
  - MS Excel (or other Excel file viewer)

### Other programs

For motor control, activity calculations, and profiling in 1, 2, or 3 dimensions, we recommend that you use SensorTrace PRO.

For photosynthetic experiments using the light-dark switch technique, we recommend that you use SensorTrace PHOTO.

## INSTALLING THE SOFTWARE

Make sure that you are installing in the administrator mode. Start the installation program (.exe file) from the CD. Follow the instructions given by the installation program. This will install the SensorTrace BASIC program and a version of this manual in the program group "Unisense". A configuration utility for the A/D-converter will also be installed. This is called Instacal and will be placed in a program group called "Measurement Computing".

## GETTING STARTED

1. Make sure that your PC does not enter sleep mode or stand by during measurements as this will interrupt the connection to the instruments and it will be necessary to restart the program.
2. Connect all instruments in your set-up to the computer.
3. Start SensorTrace BASIC - it is placed in the program group "Unisense". The following dialog appears:



4. Choose either to make a new experiment or load an old experiment.
  - a. New experiment: A dialog appears where you can choose name and location of your new data
  - b. Load old experiment: A dialog appears where you can choose the file you would like to open. This mode is for

### **IMPORTANT**

*Please make sure that your PC does not enter sleep mode or stand by during measurements as this will interrupt the connection to the instruments and it will be necessary to restart the program.*

working with old data; settings and parameters cannot be changed, and new measurements cannot be started.

5. Press **OK**.

## SENSORTRACE BASIC INTERFACE

The SensorTrace BASIC interface is divided into two main areas. The lower area, the Strip Chart, shows the sensor signals and event marks continuously to provide the user an overview of the entire experiment. The strip chart is shown in all tabs of the program.

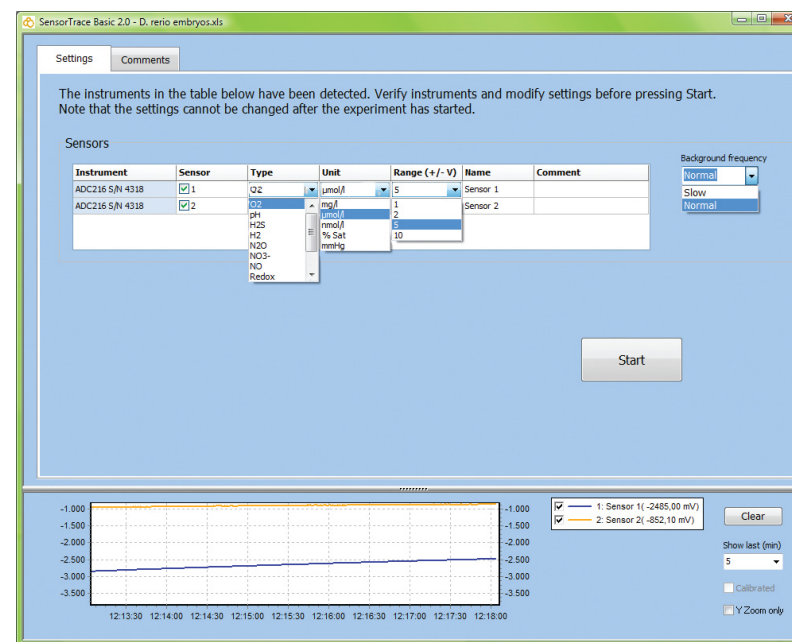
The upper area is divided into tabs which allow the user to access different functions of the program.

All components will be described in detail on the following pages.

## THE STRIP CHART

The Strip Chart graph is permanently visible in the lower part of the SensorTrace BASIC interface. It allows the user to view sensor signals continuously. By default, uncalibrated raw sensor signals are shown, but if the Calibrated check-box is checked, calibrated values are plotted (for calibrated sensors). The strip chart holds a maximum of 24 hours of measurements.

You can change the height of the window by dragging its upper border.



Comments, calibrations points, and other events generated by the user or the program can be seen as colored marks in the strip chart window. By holding the cursor over the mark, the associated text is displayed next to the mark. See also the section on the Comments tab for further information on comments and events.

### X-axis scale

By default, the time scale (x-axis) is controlled in the “Show last (min)” box, where a number of preset time intervals can be chosen. To have a look at a certain time span, zoom in on this area by dragging a rectangle with the mouse from the upper left corner to the lower right corner of the area of interest (only works if the “Y zoom only” box to the right is un-checked). To un-zoom, drag a rectangle from the lower right to the upper left corner.

### Y-axis scale

By default, the y-axis autoscales to accommodate the maximum and minimum signals that are shown in the strip chart. The y-axis scale can be modified on the “Chart format” dialog (see below), which appears when right-clicking on the y-axis (NB only works after pressing Start). If minimum and maximum values are entered into the “Value” fields in this window, un-zooming will return the scale to these values.

### Calibrated/un-calibrated

The user can control whether the graphs show calibrated signals or raw signals for the sensors by checking the “Calibrated” checkbox for each graph. If no calibration has been performed (see Calibration tab section below) and the checkbox is checked, no signals will be plotted.

### Chart legend

To the right of the chart there is a legend showing the graph format for the associated sensors and their current signal/concentration value.

### Datapoints

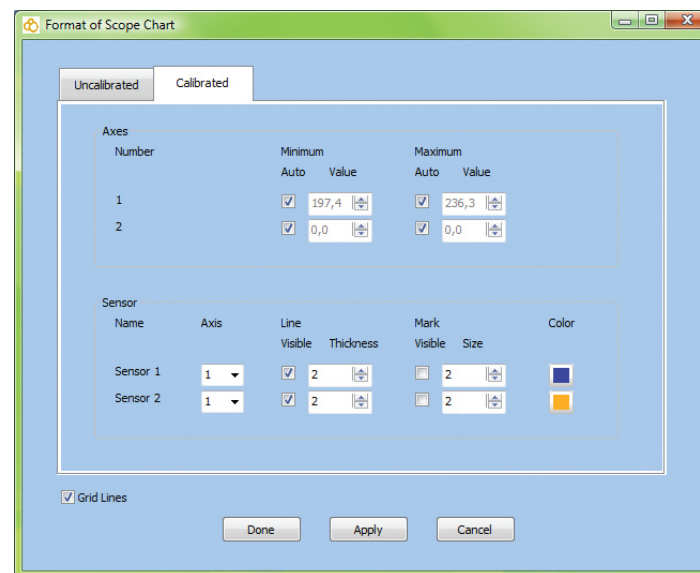
The datapoints in the Strip chart window can be cleared by pressing **CLEAR**. This will NOT affect the stored data measured in the Logger tab.

#### THE CHART FORMAT DIALOG

The Chart format dialog appears when the Y-axis of the Strip chart window is pressed (only works after Start has been pressed). It is possible to use multiple y-axes (up to four) in each chart in

SensorTrace BASIC. This allows the user to view sensor signals/values of different scales in the same graph

Modifications of axes and signal representation can be made for both calibrated and uncalibrated signals on separate tabs.



*The Chart Format dialog when two sensors are active.*

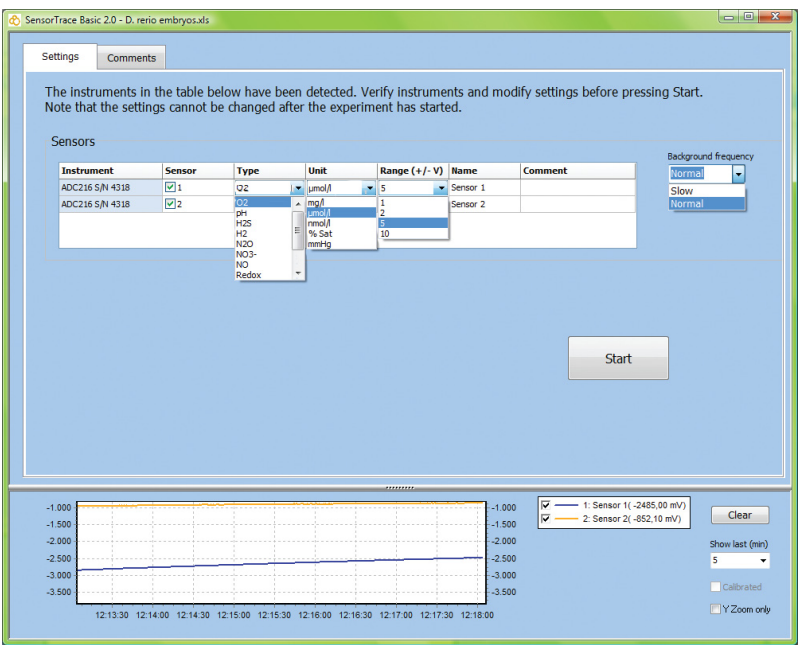
In the upper part of the Chart Format window, you can modify the maximum and minimum values on each axis. By default, the axes are set to autoscale to accommodate the maximum and minimum concentrations/signals shown in the chart, but you can modify the maximum and minimum values by typing new values in the appropriate boxes.

In the lower part of the Chart Format window, you can assign sensors to the different axes by choosing the desired Axis number for each sensor. In this area, you can also set the visibility and format of lines and marks on the graphs.



# SETTINGS TAB

After the filename has been selected in the startup dialog, the first tab to appear in the upper area is the Settings tab. This tab will display the detected hardware and sensors. In the Sensors table, various parameters for the sensor(s) can be chosen.



**Sensor:** Mark the checkboxes for the sensors you want to view and record signals from

**Type:** Choose sensor type from the drop-down menu if the default value is not appropriate.

**Unit:** Select an appropriate concentration unit for the sensor signal when calibrated.

**Range (V):** Select the voltage range for the AD-converter. Select this range as small as possible to get the most out of the resolution of the A/D-converter. However, the range should not be chosen so small that the signal gets beyond the selected range. This will

*The Settings tab  
shown with all  
menus down for  
overview.*

cause the A/D-converter to get saturated.

**Name:** Write a name describing your sensor (optional).

**Comment:** Write a comment about your sensor (optional).

## BACKGROUND FREQUENCY

To the right of the table, SensorTrace BASIC allows you to select the frequency of the background data acquisition. This determines the frequency with which the A/D-converter reads the signal from the instruments.

If you are using a computer which may be slow or less powerful than specified in the computer requirements for the program, you can set this to slow. This will cause the A/D-converter to read data with a speed of 100Hz (100 times per second) instead of 1000 Hz. This will put less strain on the computer but result in more noisy measurements. In most instances, especially if your computer meets the standards in the specifications, you should leave this on normal.

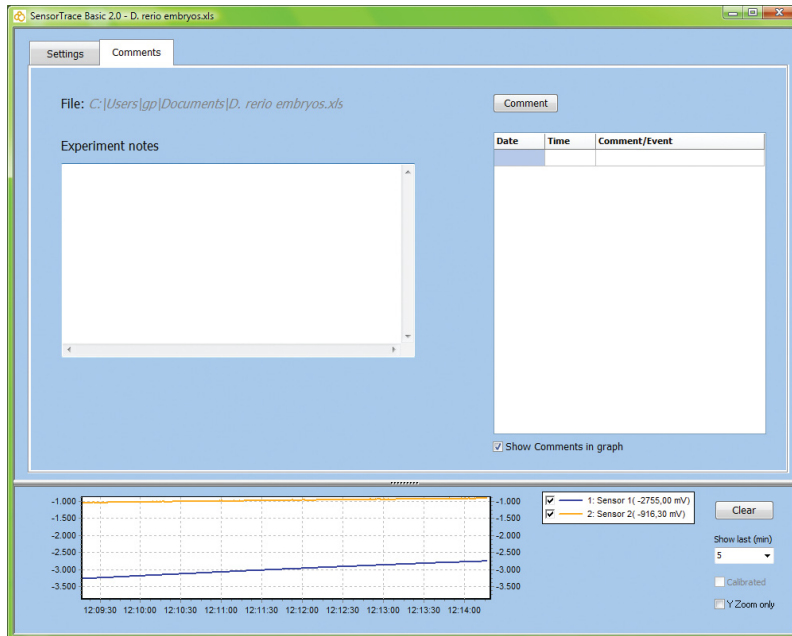
The background frequency is NOT the same as the sampling interval chosen in the Logger tab. Each logged point is an average of many measurements. The sampling interval denotes how often a data point is logged. The background frequency determines how many measurements are included in the average (read more in the section on the Logger tab under Sampling interval).

Note that settings cannot be changed after pressing Start

When the settings are appropriate, press **START**. The sensor and A/D converter settings will be saved and two more tabs will appear (Calibration and Logger).

## COMMENTS-TAB

The Comments tab allows the user to enter notes and comments regarding the measurements in the file.



"File": shows the path and the filename selected previously in the Start dialog.

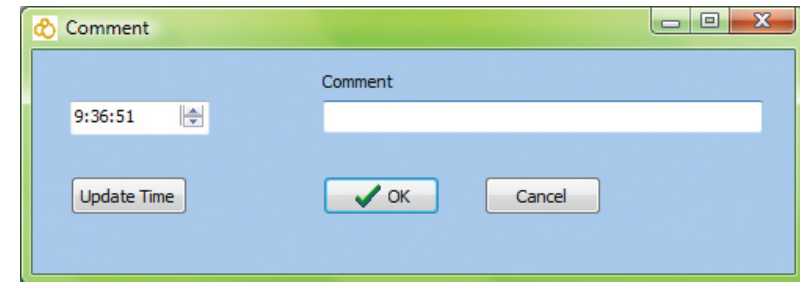
"Experiment notes": In this field any text that you want to save with your data (e.g. a general description of your experiment) can be entered.

Comments: SensorTrace BASIC allows the user to make comments with a timestamp which will be displayed on both the Strip Chart and Logger graphs. This enables the user to get a better overview of the course of an experiment. Pressing **COMMENT** (keyboard shortcut Ctrl K) will make the following dialog appear where

### TIP

The keyboard shortcut for adding a comment is Ctrl K

the comment can be entered along with a timestamp from the time the button is pushed. The timestamp can be updated to the current time by pushing the **UPDATE TIME** button. Thus this feature allows the user to either 1) press the button just when observing an unforeseen event and then write the appropriate text later or 2) write the text first, wait for an expected event and press **UPDATE TIME** when the event occurs.



The events will be listed in the table to the right and an indication will be displayed in the graph in the Strip chart window.

In addition to the user-generated comments, the program will time stamp and show events, for instance calibrations.

All comments and events are stored in the output file.

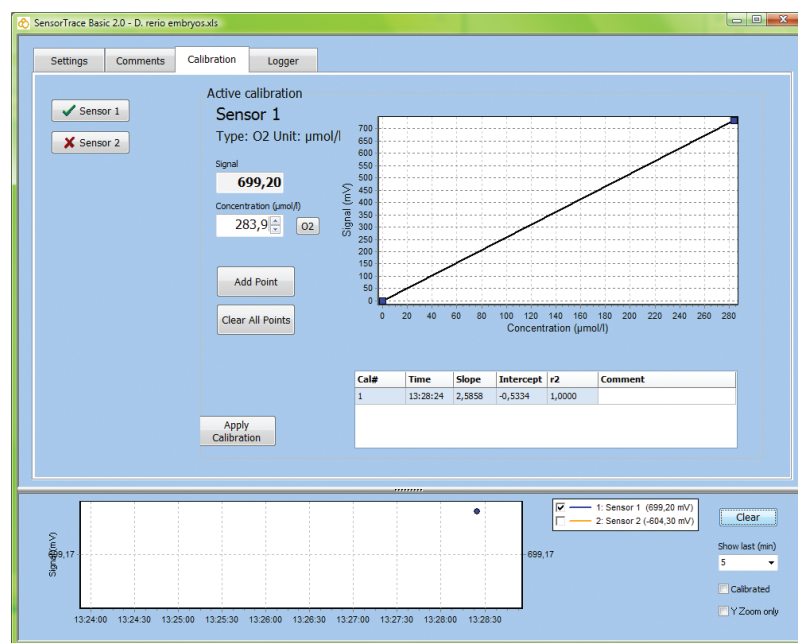
## CALIBRATION-TAB

Calibrations are performed in the Calibration tab. The buttons in the top left corner show whether the sensors are calibrated or not (the layout will change if there are more than eight sensors).

Uncalibrated



Calibrated



Choose the sensor you would like to calibrate. The sensor name, type and calibration unit is shown under "Active calibration"

"Signal": Shows the current raw sensor signal for the chosen sensor. The sensor signal can also be followed continuously in the strip chart-window in the bottom of the tab.

## CALIBRATION PROCEDURE:

1. Prepare the calibration samples
2. Choose the sensor you want to calibrate.
3. Change the concentration in the concentration box according to the actual calibration solution. For oxygen, an automated procedure to calculate the atmospheric saturation as a function of temperature and salinity can be invoked by pressing the button named **O2**.
4. After entering the correct concentration, add the calibration point by pressing **ADD POINT**. Several points can be added for each concentration.
5. Change to another calibration standard and repeat points 3-4. It is possible to use several different standards and make a multi-point calibration to verify linearity.
6. If any calibration points are not valid (e.g. due to typing errors), a single point can be cleared by right-clicking the point and choosing "Delete point". All calibration points can be removed by pressing **CLEAR ALL POINTS**.
7. When you are satisfied with your calibration, press **APPLY CALIBRATION**. A linear regression will be performed based on the calibration, and this regression will form the basis for converting signals to calibrated values. Values are displayed in the table.
8. Repeat 2-7 for other sensors

The calibration table below the calibration graph shows the

calibrations for the chosen sensor. Each calibration will appear here with information on calibration number, time of calibration, linear regression data (slope, intercept and  $r^2$ ) as well as additional user comments that can be entered directly into the table. For information on calibration of specific sensors consult the sensor manuals

#### RECALIBRATION PROCEDURE

Sensors can be recalibrated at any time during an experiment. The new calibration applies from the time of calibration onward. To recalibrate the sensor:

1. Press **CLEAR ALL POINTS**
2. Follow step 1-6 in the Calibration procedure.

All calibration data are stored in the output excel-file.

#### RETRIEVING A CALIBRATION

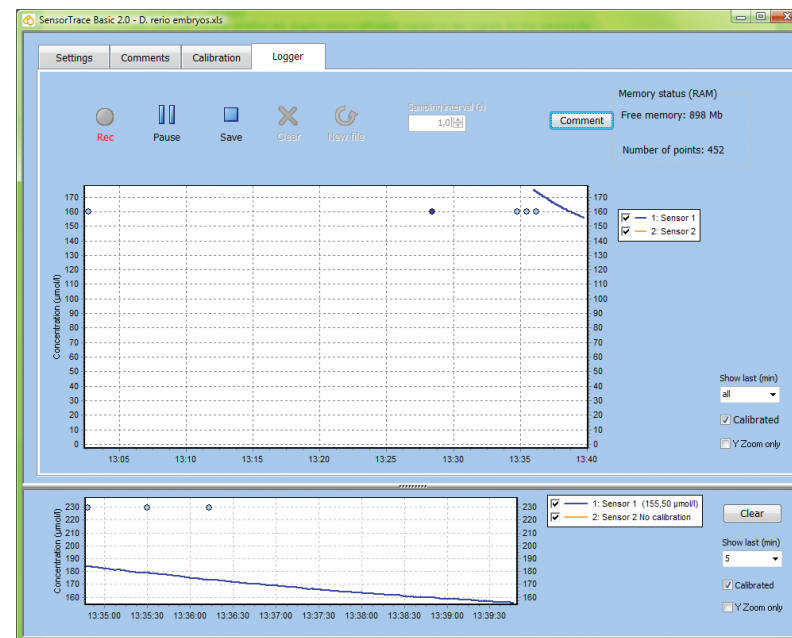
Pressing **RETRIEVE CALIBRATION** will retrieve the calibration of the sensor made the last time the program was running. If you want to use the retrieved calibration, remember to press **APPLY CALIBRATION** after retrieving a calibration.

Note! When retrieving a calibration you will load the last calibration made the previous time the program was running. Make sure that the retrieved calibration matches your current sensor in terms of signal size and units.

**IMPORTANT**  
When retrieving a calibration you will load the last calibration made the previous time the program was running. Make sure that the retrieved calibration matches your current sensor in terms of signal size and units.

## LOGGER-TAB

The Logger-tab is where data collection is performed.



#### SAMPLING INTERVAL

The sampling interval denotes how often the program will make a data point (for the log file and in the graph). A single data point consists of an average of measurements sampled with the background frequency in the sampling interval preceeding the data point (up to 10 s). In other words, with a sampling interval of 10s, the data points are logged every 10s as an average over 1000 samples per second during the previous 10s. The Background frequency is preset to 1000Hz and can be changed on the Settings tab ("Background frequency").

It is important to know the system you are measuring in in order to choose the right sampling interval and not "average out" the fluctuations that you are expecting. For a relatively active system,

for example, it is preferable to choose a short sampling interval. For a long, perhaps linear, monitoring situation, a longer sampling interval will save computer memory.

The sampling interval cannot be changed while logging. If you need to change your sampling interval, sampling must be interrupted (PAUSE or SAVE, see below) before the interval can be changed. Resume logging by pressing REC.

In the upper right corner you can follow the "Memory status" on the amount of free memory space and on the number of points made.

## RECORDING DATA

Before you start the recording, choose the relevant sampling interval.

Then, press REC and the data will be logged in the PC memory. An Excel file is created when you close the program or when you press SAVE.



Record data



Pause data



Stop data acquisition and save to a specified file



Delete the data file



Make a new data file

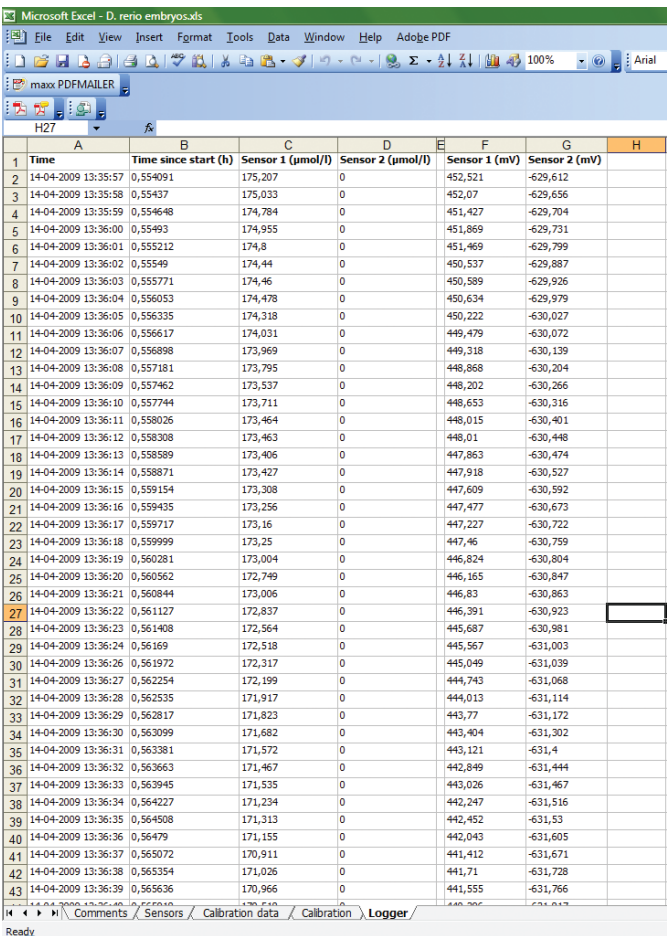
## Comments

Pressing COMMENTS will make a dialog appear where a comment can be entered along with a timestamp from the time the button is pushed. The timestamp can be updated to the current time by pressing UPDATE TIME. This feature allows the user to either 1) press the button just when observing an unforeseen event and then write the appropriate text later or 2) write the text first, wait for an expected event and press Update time when the event occurs. The events will be shown in the table to the right and an indication will be displayed in the graph in the "Strip chart window".

The comment will be added to the table on the Comments tab.

# OUTPUT-FILE

All logged data and text entered and stored in your SensorTrace BASIC program are accessible in an Microsoft Excel output file to facilitate processing and graphic representation of the data. Importing and converting text files is thus not necessary when using Unisense software. However, make sure that you have a program that can view or import Microsoft Excel files.



	A	B	C	D	E	F	G	H
1	Time	Time since start (h)	Sensor 1 (µmol/l)	Sensor 2 (µmol/l)	Sensor 1 (mV)	Sensor 2 (mV)		
2	14-04-2009 13:35:57	0,554091	175,207	0	452,521	-629,612		
3	14-04-2009 13:35:58	0,55437	175,033	0	452,07	-629,656		
4	14-04-2009 13:35:59	0,554648	174,784	0	451,427	-629,704		
5	14-04-2009 13:36:00	0,55493	174,955	0	451,869	-629,731		
6	14-04-2009 13:36:01	0,555212	174,8	0	451,469	-629,799		
7	14-04-2009 13:36:02	0,55549	174,44	0	450,537	-629,887		
8	14-04-2009 13:36:03	0,555771	174,46	0	450,589	-629,926		
9	14-04-2009 13:36:04	0,556053	174,478	0	450,634	-629,979		
10	14-04-2009 13:36:05	0,556335	174,318	0	450,222	-630,027		
11	14-04-2009 13:36:06	0,556617	174,031	0	449,479	-630,072		
12	14-04-2009 13:36:07	0,556898	173,969	0	449,318	-630,139		
13	14-04-2009 13:36:08	0,557181	173,795	0	448,868	-630,204		
14	14-04-2009 13:36:09	0,557462	173,537	0	448,202	-630,266		
15	14-04-2009 13:36:10	0,557744	173,711	0	448,653	-630,316		
16	14-04-2009 13:36:11	0,558026	173,464	0	448,015	-630,401		
17	14-04-2009 13:36:12	0,558308	173,463	0	448,01	-630,448		
18	14-04-2009 13:36:13	0,558589	173,406	0	447,863	-630,474		
19	14-04-2009 13:36:14	0,558871	173,427	0	447,918	-630,527		
20	14-04-2009 13:36:15	0,559154	173,308	0	447,609	-630,592		
21	14-04-2009 13:36:16	0,559435	173,256	0	447,477	-630,673		
22	14-04-2009 13:36:17	0,559717	173,16	0	447,227	-630,722		
23	14-04-2009 13:36:18	0,559999	173,25	0	447,46	-630,759		
24	14-04-2009 13:36:19	0,560281	173,004	0	446,824	-630,804		
25	14-04-2009 13:36:20	0,560562	172,749	0	446,165	-630,847		
26	14-04-2009 13:36:21	0,560844	173,006	0	446,83	-630,863		
27	14-04-2009 13:36:22	0,561127	172,837	0	446,391	-630,923		
28	14-04-2009 13:36:23	0,561408	172,564	0	445,687	-630,981		
29	14-04-2009 13:36:24	0,56169	172,518	0	445,567	-631,003		
30	14-04-2009 13:36:26	0,561972	172,317	0	445,049	-631,039		
31	14-04-2009 13:36:27	0,562254	172,199	0	444,743	-631,068		
32	14-04-2009 13:36:28	0,562535	171,917	0	444,013	-631,114		
33	14-04-2009 13:36:29	0,562817	171,823	0	443,77	-631,172		
34	14-04-2009 13:36:30	0,563099	171,682	0	443,404	-631,302		
35	14-04-2009 13:36:31	0,563381	171,572	0	443,121	-631,4		
36	14-04-2009 13:36:32	0,563663	171,467	0	442,849	-631,444		
37	14-04-2009 13:36:33	0,563945	171,535	0	443,026	-631,467		
38	14-04-2009 13:36:34	0,564227	171,234	0	442,247	-631,516		
39	14-04-2009 13:36:35	0,564508	171,313	0	442,452	-631,53		
40	14-04-2009 13:36:36	0,56479	171,155	0	442,043	-631,605		
41	14-04-2009 13:36:37	0,565072	170,911	0	441,412	-631,671		
42	14-04-2009 13:36:38	0,565354	171,026	0	441,71	-631,728		
43	14-04-2009 13:36:39	0,565636	170,966	0	441,555	-631,766		

The worksheets in the Excel-file reflect the tabs in the SensorTrace BASIC software. However, for technical reasons there are two sheets of calibration data (see picture and the table below).

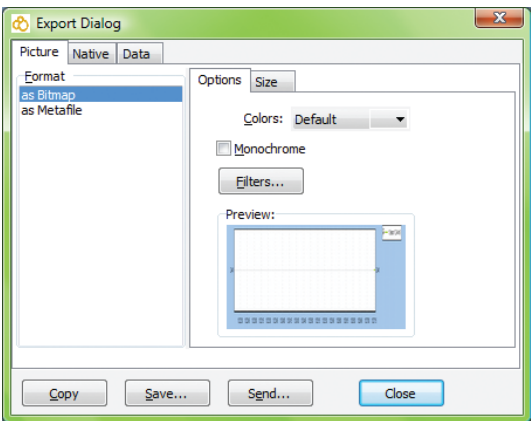
SensorTrace BASIC tabs	Excel worksheet
Settings	Sensors
Comments	Comments
Calibration	Calibration data and Calibration
Logger	Logger

## DIRECT EXPORT OF GRAPHS

The content of all graphs in SensorTrace BASIC can be exported, either as graphics or as a data file. This option is particularly useful for conserving the data in the Strip Chart, which is not saved in the normal Excel file.

To export a graph, right-click on the graph. This returns a small menu with two options: Export and Print.

Choosing "Export" makes a dialog box appear with three tabs Picture, Native, and Data and the buttons COPY, SAVE, SEND, and CLOSE.



The chosen tab determines the type of data:

- **Picture:** the data is a graphic, either a bitmap or a Windows metafile as determined on the tab.
- **Native:** this tab is redundant and can be disregarded.
- **Data:** the data are data values in a format chosen by the user on the tab. It is possible to choose only one sensor in the series drop-down box. Each sensor is mentioned two times. First time a sensor is mentioned data represents uncalibrated data; the second time, it represents calibrated data.

The buttons have the following functions

- **COPY:** copies data to the Windows Clipboard and can then be pasted directly into Excel (or other program) by pressing CTRL-V or Edit/Paste.
- **SAVE:** prompts for a filename and path where the data is saved
- **SEND:** sends data as an attachment to an email.
- **CLOSE:** closes the dialog.

## WARRANTY AND LIABILITY

Microsensors are consumable items. The sensors are tested thoroughly before packaging and shipment.

Warranty for sensors:

N<sub>2</sub>O sensors: 60 days from shipment.

Standard Oxygen sensors: 180 days from shipment.

All other sensors excluding special sensors: 90 days from shipment.

If, within the above specified period, the sensor(s) fail to perform according to the specifications, Unisense will replace the sensor(s) free of charge.

Unisense will only replace dysfunctional sensors if they have been tested according with the instructions in the manual upon receipt of the sensor(s). The warranty does not include repair or replacement necessitated by accident, neglect, misuse, unauthorized repair, or modification of the product. Physical damage to the tip of the sensor is not covered by the warranty.

Liability

In no event will Unisense be liable for any direct, indirect, consequential or incidental damages, including lost profits, or for any claim by any third party, arising out of the use, the results of use, or the inability to use this product.

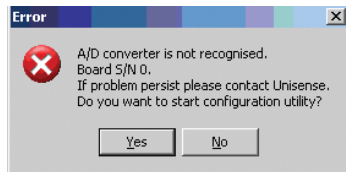
## REPAIR OR ADJUSTMENT

Sensors and electrodes cannot be repaired. Other equipment that is not covered by the warranty will, if possible, be repaired by Unisense with appropriate charges paid by the customer. In case of return of equipment please contact us for a return authorization.

For further information please see the documents "Conditions for Sale and Delivery for Unisense" and "Warranty and Shipping Information".

## TROUBLE SHOOTING

**Problem** Following error message appears



**Possible cause 1** You have not connected your digital sensor instrument or A/D-converter.

**Possible cause 2** The program does not recognize the analog-to-digital converter

**Possible cause 3** An A/D-converter with different bit-resolution has just been connected

**Solution** Choose “yes” to open configuration utility (InstaCal). InstaCal will clear any old A/D-converters not connected to your system and search for connected A/D-converters

**Problem** “Noisy” measurements

**Possible cause 1** Physical vibrations from other appliances on the table are causing movements of the sensor resulting in instability of experimental set-up and disturbances in the measurements.

**Solution** Remove all unrelated appliances from surfaces in contact with the experimental set-up and ensure completely stable conditions for the sample.

**Possible cause 2** Electric noise in the system.

**Solution** Check that the system is properly grounded. Connect the Ground connection on your sensor instrument to a ground source (a waterpipe or similar). Sometimes it can also help to ground the meter directly to your measuring set-up with a wire going from the Ground connection of the sensor instrument to the liquid you are measuring in.

**Solution** Change the Background frequency.





UNISENSE, DENMARK

[www.unisense.com](http://www.unisense.com) · [info@unisense.com](mailto:info@unisense.com)